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# Control of Vegetative Growth in Hau (*Hibiscus tiliaceus*)

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## Objective

This research was conducted to determine whether commercially available growth retardants would effectively retard the vigorous growth of the hau tree (*Hibiscus tiliaceus* L.) and, if so, at what rates. Hau has been widely used in coarse landscaping situations as a windbreak, hedge, or screen because of its vigorous growth. However, frequent pruning is necessary where maintenance is required.

The common hedge hibiscus, *H. rosa-sinensis*, is readily controlled by growth retardants such as chlormequat (Criley 1980, 1981; Sedgely et al. 1981; Wilkins and Kotechi 1982), uniconazole (Maus 1987, Newman et al. 1989, Wang and Gregg 1991) and paclobutrazol (Maus 1987, Wang and Gregg 1991). The most effective compound, chlormequat, is only registered for potted hibiscus, while both paclobutrazol and uniconazole have more broadly written labels.

## Methods

The first experiment compared spray and drench applications of four retardants (Table 1) on potted hau plants grown from cuttings. The second experiment compared one, two, or three spray applications of single rates of three retardants (Table 2) on potted Hau plants. The third experiment was designed to determine how long a single application (Table 3) to the foliage and bark of

**Table 1. Treatments applied to hau to determine retardant effectiveness. Rates chosen from effective rates as reported in the literature.**

| Chemical | Application | Rate |
|---|---|---|
| control | – | – |
| chlormequat | drench | 1 gm a.i./pot |
| chlormequat | spray | 1500 ppm |
| paclobutrazol | drench | 1 mg a.i./pt |
| paclobutrazol | spray | 25 ppm |
| uniconazole | drench | 1 mg a.i./pt |
| uniconazole | spray | 1 mg a.i./pot |
| flurprimidol | drench | 1 mg a.i./pot |
| fluprimidol | spray | 25 ppm |

**Table 2. Growth retardant treatment of hau to determine response to multiple applications. Repeat applications were made at 10-day intervals.**

| Chemical | Rate (ppm) | Frequency |
|---|---|---|
| control | – | – |
| chlormequat | 1500 | 1 |
| chlormequat | 1500 | 2 |
| chlormequat | 1500 | 3 |
| uniconazole | 25 | 1 |
| uniconazole | 25 | 2 |
| uniconazole | 25 | 3 |
| paclobutrazol | 25 | 1 |
| paclobutrazol | 25 | 2 |
| paclobutrazol | 25 | 3 |

**Table 3. Single applications of growth retardants to hau to determine effective duration of retardation. Application was made to foliage and bark.**

| Chemical | Rate (ppm) |
|---|---|
| control | – |
| chlormequat | 1000 |
| chlormequat | 2000 |
| chlormequat | 3000 |
| uniconazole | 20 |
| uniconazole | 30 |
| uniconazole | 40 |
| paclobutrazol | 20 |
| paclobutrazol | 30 |
| paclobutrazol | 40 |



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potted hau plants would suppress growth.

All plants were grown in a greenhouse in 1-gallon pots of a 1:1:1 soil-peat-perlite medium amended with 18-6-12 Osmocote, treble superphosphate, dolomite, and Micromax at the rates of 113.5, 57, 170, and 25 g/ft$^3$. The plants were irrigated twice daily with a liquid feed containing 200 ppm each of N and K. At the time of treatment, the plants were pruned to a single leader and graded into replications of similar size plants. The experimental designs utilized 9 or 10 single plant replications per treatment, and the plants were arranged in a completely randomized design on the greenhouse bench. Light levels were not measured, but shading in the greenhouse reduced the light intensity to about one-half of outside.

**Results**

**Experiment 1.** Effective control of shoot growth was achieved with both sprays and drenches of all four retardants as determined one month after treatment (Figure 1). After two months, the sprayed plants were taller than drenched plants in the uniconazole and flurprimidol treatments, but sprayed and drenched plants in the chlormequat and paclobutrazol treatments were comparable.

**Experiment 2.** All three retardants were effective with single or multiple sprays (Figure 2). Two or three spray applications provided slightly more retardation than a single application as determined both by branch length and increment of growth of the main stem.

**Experiment 3.** Increasing concentrations of chlormequat and uniconazole increased the retardation of both branches and the growth of the main stem (Figure 3). Paclobutrazol, while effective in retarding hau, did not show as marked a concentration effect. Figure 4 shows the growth of hau over a three-month period after treatment for the pooled average growth of the main shoot for each retardant. Paclobutrazol was beginning to lose effectiveness after one month and resumed a growth rate similar to the controls. Paclobutrazol-treated plants were still shorter than controls at three months. Chlormequat-treated plants were slightly taller than those treated with uniconazole, but in both groups growth of the main stem was still retarded at three months. After five months (data not shown), the chlormequat plants were beginning to grow out, while uniconazole-treated plants were still retarded.

**Figure 1. Length of new growth increment for the main shoot of potted hau plants after one, two, and three months following single foliar sprays or soil drenches of chlormequat (Chlor), paclobutrazol (PBZ), flurprimidol (Flur) and uniconazole (Uni).**

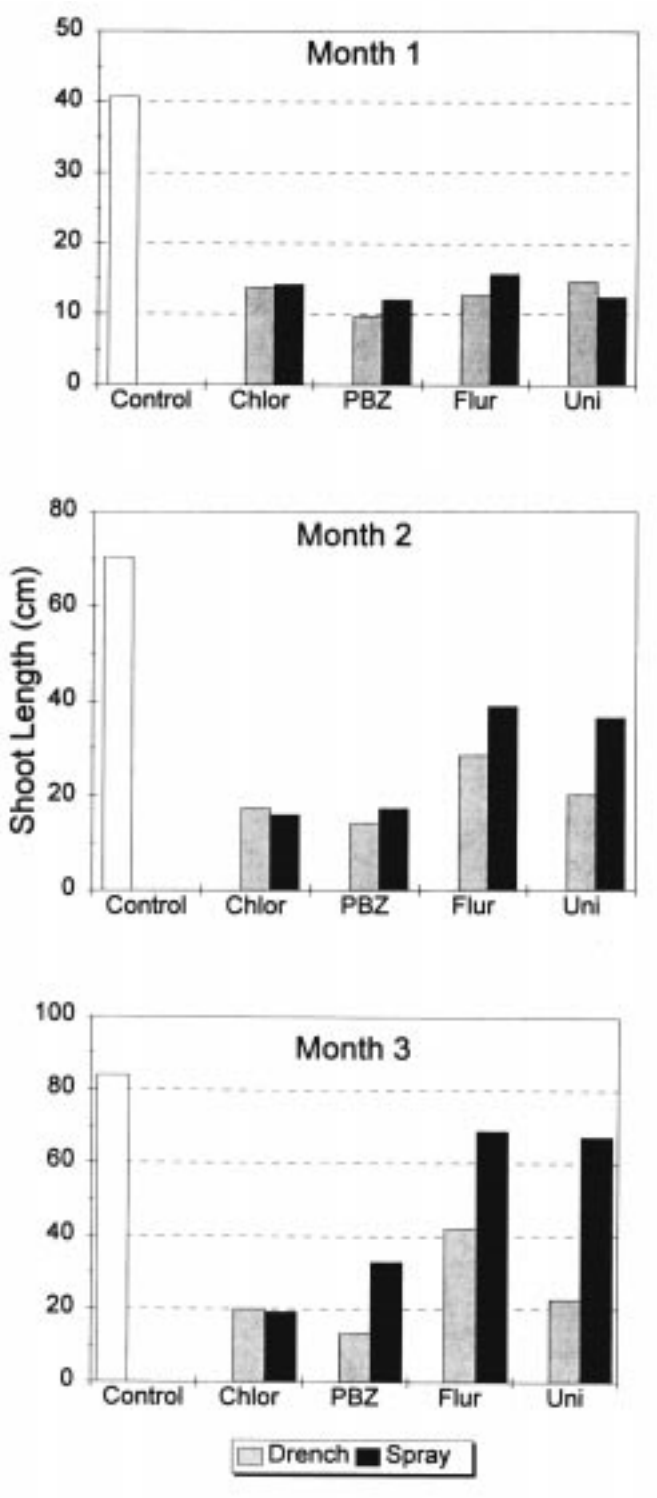


**Figure 2. Length of new growth increment for the main shoot (top) and lateral branches (bottom) of potted hau plants after one, two, or three foliar sprays of chlormequat (Chlor), paclobutrazol (PBZ), and uniconazole (Uni).**

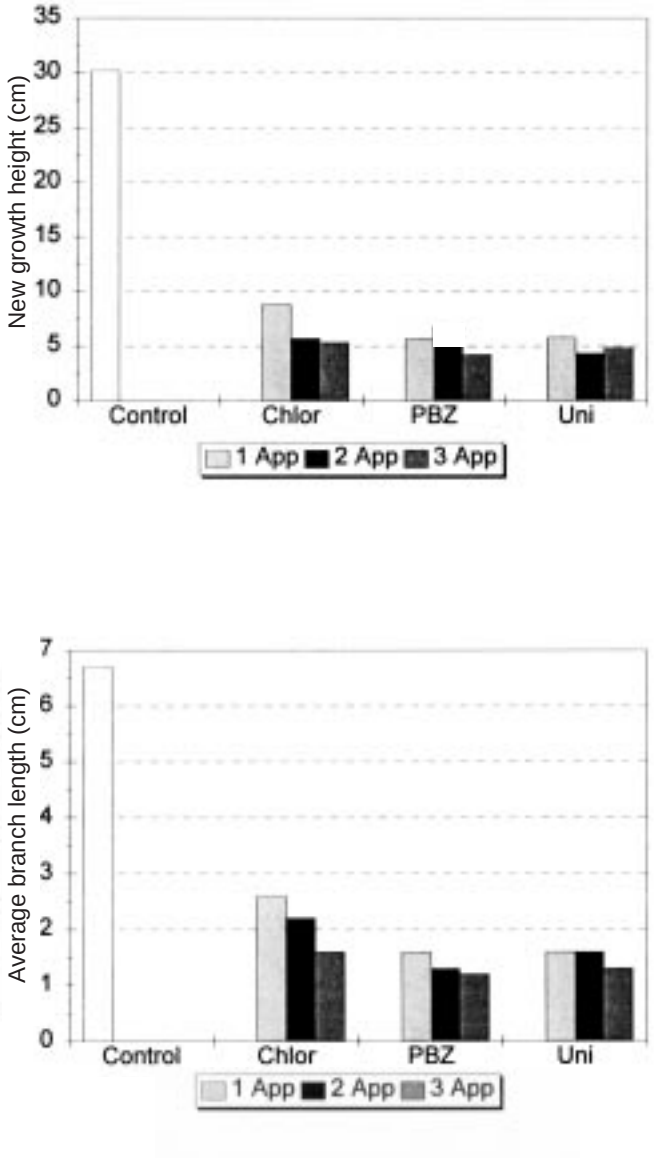
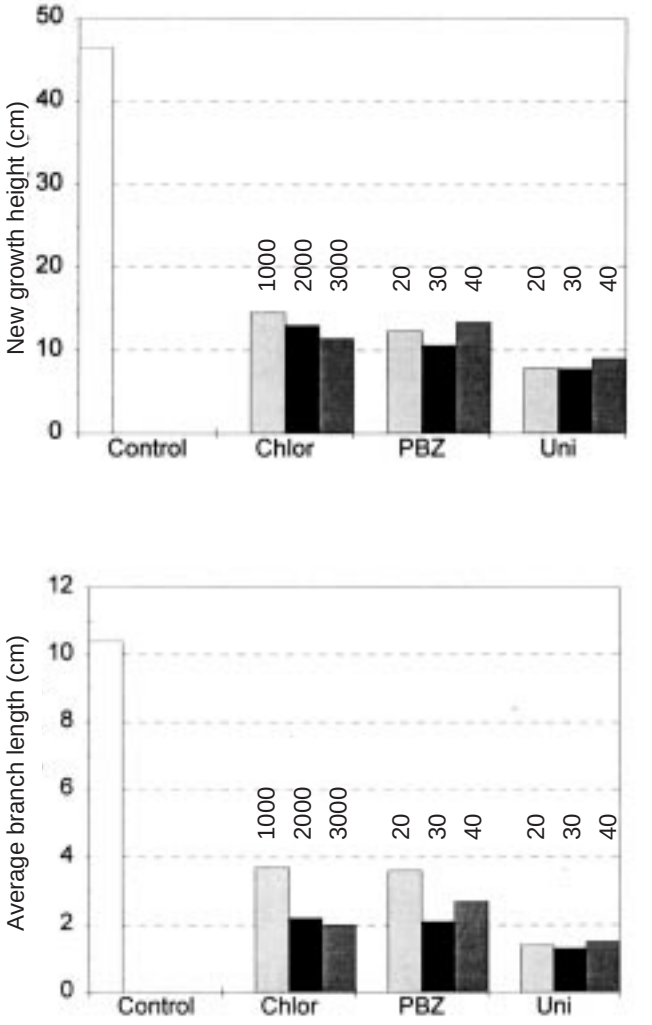



**Figure 3. Length of new growth increment for the main shoot (top) and lateral branches (bottom) of potted hau plants four weeks after single foliar applications of increasing concentration of the growth retardants of chlormequat (Chlor), paclobutrazol (PBZ), and uniconazole (Uni). Bars are labeled with growth retardant concentrations in parts per million.**




## Discussion

All the growth retardants were effective as sprays or drenches on potted *Hibiscus tiliaceus* at the rates tested. Because labels for the retardants do not normally permit drenching in the field, sprays were evaluated in two experiments. At the highest rates applied, chlormequat and uniconazole continued to retard growth through three months. One possible disadvantage to the severe retardation obtained with uniconazole was a major population of mealybugs feeding in the dense foliage. Insecticidal sprays did not penetrate the foliage because the nodes were so close.

Any of these retardants with a label for outdoor use would be effective on hau. The need to prune would be reduced considerably by regular spray application to foliage and bark. Both paclobutrazol and uniconazole are reported to be taken up more effectively by roots than foliage, but sprays directed to the bark apparently provide enough chemical to cause retardation when it is translocated to the growing points.

A long-term effect on outdoor hau plants has not been determined. However, the results of experimental foliar applications of chlormequat to hibiscus (Criley 1981) suggested that treated plants should be allowed to recover a normal growth rate rather than be held to a perpetually retarded state.

Hibiscus hedges continuously treated with chlormequat were weaker and less dense than hedges on which pruning and spraying were alternated.

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**Figure 4. Mean total heights over a three-month period for potted hau plants treated with three growth retardants. The height measurements for plants are pooled for the three concentrations of each retardant: chlormequat, paclobutrazol, and uniconazole.**